Data/Voice

`Telecommunications Premise Distribution System

Requirements and Information

Information Technology Services (ITS)
Pittsburg State University

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1. General Information

1.1. The ITS Department at Pittsburg State University is responsible for all telecommunication cabling for the entire campus and its related properties. This includes, but is not limited to voice, video, and data (VVD) cable paths and distribution systems for copper and optical fiber. The premise distribution system described herein is the wiring system that provides for the interconnecting of communications equipment located in all rooms of the university facility. It is through this Premise Distribution System (PDS) that the LAN (data network) and Voice communications are accessed and utilized by students and/or teachers and/or administrators in the school.

1.2. Manufacturer and model numbers are given through these specifications with the intention of establishing a standard of quality and operation. It is not the intention of the ITS Department to discriminate against any "approved equal" product of another manufacturer, but is intended that a definite standard be established.

1.3. The inter-building premise distribution system (PDS) used at the University is based upon the combination of twisted copper pairs and fiber optic cables. Any portion of the PDS which the Communications Contractor bids on shall conform to current University and Industry technical specifications. A comprehensive list of the applicable technical specification sections that the Communications Contractor must adhere to is provided in this document. This will allow the bidder an opportunity to identify what is required by the University for a complete installation. This does not necessarily mean that the detailed requirements necessary to complete any project is fully understood or explained in this document.

1.4. All new, renovated and remodeled buildings on the campus of Pittsburg State University will have telecommunications wiring and distribution systems that adhere to the latest TIA/EIA Standards.

1.4.1. TIA/EIA 568 Commercial Building Telecommunications Cabling Standard

1.4.2. TIA/EIA 569 Commercial Building Standard for Telecommunications Pathways and Spaces

1.4.3. TIA/EIA 607 Commercial Building Grounding and Bonding Requirements for Telecommunications

1.4.4. TIA/EIA 606 Administration Standard for the Telecommunications Infrastructure

1.5. The General Requirements Section is a summation of these Commercial Buildings Standards that mention key points of the standards. It is not intended to be a complete listing of all applicable sections. The Communications Contractor should refer to the actual published standards document. The Specific Requirements Section lists requirements that are specific to Pittsburg State University.

2. The ITS Department is located on the Northwest corner of the Pittsburg State University campus, 157 Kelce, Pittsburg State University, Pittsburg, KS 66762-7519. Phone: (620) 235-4603 FAX (620) 235-4377. URL: www.pittstate.edu/office/information-services/

2.1. Contacts:

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3. Scope of Work

- The contractor shall furnish all materials, equipment, labor, and services required for the installation of a complete premise distribution wiring system for voice and data.
- The contractor will perform all work with regular employees of an organization which has regularly been engaged in the installation and servicing such installations for not less than three years; that can demonstrate the capability to adequately install and service this system within the requirements of the contract documents.
- The installation shall be in accordance with the latest requirements of the National Electrical Code, State and local codes, ordinances and regulations of any other governing body having jurisdiction. BICSI Telecommunications Distribution Methods Manual shall be used as a guideline for this installation.
- All equipment and materials furnished under this contract shall be new; including wiring and cabling, and shall be warranted by the contractor for a period of 1 year from date of final acceptance of the system against electrical or mechanical defects (except when such defects are caused by misuse.)
- Complete sets of "as built" drawings of the system shall be supplied by the installing contractor. Two sets delivered to the ITS Department at Pittsburg State University. These drawings shall include all jack & conduit locations, pull boxes, identification marking, cable records, etc.

4. General Requirements

- The contractor shall provide all patch panels, cabling, wire hangers, surge protectors, communications outlets, equipment racks, ladder racks, and any other accouterment necessary in accordance with the drawings, wiring schedule and schematic diagrams in all of the wiring closets and in the central equipment room (located in a central location within the site).
- The premise distribution system shall adhere to the latest ANSI/EIA/TIA-568A, ANSI/EIA/TIA-569A Commercial Building Telecommunications Cabling Standard, BICI Telecommunications Distribution Methods Manual, IEEE Standard 802.3.xx, and the National Electric Code (NEC) compliant.
- The system must be based on structured, open distribution architecture so that proposed equipment and facilities, as well as future equipment from other vendors, can be supported by the system.
- All basic jacks, patch panels, cable, etc. shall be listed by Underwriters Laboratories Inc. and shall be products of a manufacturer of established reputation and experience. The manufacturer shall have supplied similar apparatus to comparable installations rendering satisfactory service.
- The setup and design of the main communications room and all wiring closets shall be at the direction of the ITS appointed representative.
- All equipment in the wiring closet (i.e., network bridging devices, multi-port repeaters, power supplies, etc.) is to be rack mounted and arranged such that cross-connection activity can be efficiently accomplished. For ease of use and to simplify computer maintenance, terminations for data cable (blue jacket) shall be made on Category 6 patch panels mounted in open equipment racks. Cable pairs shall be terminated directly to the patch panels in alphanumeric order at the direction of the ITS appointed representative. The eight-position pin/pair assignments shall conform to the T568B designation. Terminations for the voice cable (white jacket) shall be made on 110 cross-connecting blocks mounted in open equipment racks. Cable pairs shall be terminated directly to the cross-connecting blocks in alphanumeric order at the direction of the ITS appointed representative. The eight-position pin/pair assignments shall conform to the T568B designation.
- All cables shall be neatly secured into place and neatly racked using approved support hardware. All cables shall be labeled as shown on the drawings at both station outlet and equipment rack ends.

4.1. Entrance Facilities

4.1.1. Entrance facilities will consist of rigid metallic conduit from the PSU utility tunnel or via trenching/boring from facilities as specified by the ITS Department. This entrance conduit will extend into the primary communications room in the building. The number of the conduit(s) will depend on the size of the building served. Four-inch conduits will be provided for the entrance cables that run from the main communications room, to a point of the property line that will be determined by the owner. All conduit bends will conform to the largest diameter cable specified. These conduits are to be stubbed, capped and marked. Entrance facilities will be installed in accordance with NEC codes and all applicable EIA/TIA standards.

4.1.2. All inter-building conduits will be plugged air tight after all cable is installed.

4.2. Telecommunications Rooms

4.2.1. All Telecommunications equipment rooms must have HVAC systems capable of maintaining a temperature range of between 68- and 78-degrees Fahrenheit, and a relative humidity (RH) of 50%, 24 hours a day, 7 days a week. This will provide an environment suitable for computer and telecommunications equipment. A separate system may be required if the building is served by an energy management system.

4.2.2. The following spaces will not be accepted for any telecommunications room if any of the following conditions exist:

- Any non-Voice/Data, fiber, or copper existing or passing thru Communications rooms.
- Any (wire path or entrance) access route is through an office, classroom, bathroom or closet.
- The room (including the ceiling and floor) contains water pipes, steam pipes, waste pipes, drains, air handling units, Plenums, EMI/RFI interference, transformers, motors, other electrical panels, chemical exposure or janitorial workspaces/storage.
- Showers or toilet areas adjacent to or above the telecommunications rooms.
- Energy management, alarm panels or commercial CATV equipment exist within the room.

4.2.3. All Telecommunications rooms will have the following:

- 3’x7’ one-hour fire rated keyed entry door, opening out
- Vinyl tiled floor
- No ceiling
- At least 2 Quad 20A 120V electrical outlets on separate walls
- Standard fluorescent lighting with light switch
- Single point of ground as referenced by TIA/EIA 607 Commercial Building Grounding and Bonding Requirements for Telecommunications
- Communications room grounding interconnected via #6 green stranded cable to 2" grounding buss and returning to 4" grounding buss in the Main communications room.

4.2.4. The primary telecommunications equipment room shall be suitably sized for the intended use, a minimum of eight feet by ten feet floor area. The primary telecommunications equipment room must have a 30A 208VAC dedicated circuit (if applicable for equipment being installed), at least 2 Quad 20A 120V electrical outlets on a dedicated circuit, and an isolated ground busbar. This busbar must be accessible for telecommunications equipment grounding.

- The 208 VAC receptacle (if applicable for equipment being installed) shall be provided at the direction of the ITS appointed representative.

4.2.5. Secondary telecommunications rooms should be centrally located on each floor and be stacked directly above the telecommunications room below to allow for the minimum run of riser cable. The number of telecommunications rooms shall be that the distance of the cable runs between the telecommunications room on that floor and the workstation complies with all current applicable TIA/EIA 568 standards. Secondary telecommunications rooms must have three (3) 3” core holes with sleeves through the floor as specified by PSU. Secondary rooms shall be a minimum of six feet by eight feet.

4.3. Riser System

4.3.1. Telecommunications rooms will be connected by a minimum of three (3) 3-inch sleeves or conduit. Both sleeves and conduit will be stubbed to a maximum of 4" above the finished floor. Plastic bushings will be provided. If conduit must be extended to telecommunications rooms that are not stacked, a pull string will be provided. If there are more than two 90-degree bends in the conduit between the rooms a pull box 24"x24"x6" deep will be provided. The type and quantity of the riser communications cable will be determined during the building design phase.

4.3.2 All multi-mode fiber used for vertical risers will be installed in 1" plastic orange color innerduct. All single mode fiber used for vertical risers will be installed in 1" plastic orange color innerduct.

4.4. Horizontal Cabling System

4.4.1. Open cable trays will be provided in each main hallway. The tray shall be 4" deep x 12" wide. An appropriate number of 4" conduits, may be used in lieu of the tray when passing through firewalls. A minimum of 12-inch clearance shall be maintained on all sides of the cable tray. Cable trays are to be continuous with no offsets in the horizontal or vertical direction. Any cable placed in the horizontal distribution system will be for voice, data or campus A/V only.

4.4.2. If building design prohibits a cable tray in each main hallway provide appropriate support hardware spaced no more than 1.5 meters apart along both sides of each main hallway. Conduit will be required in areas above ceilings that do not have remove and replace lift-up ceiling tiles. Conduit or other suitable means will be required to conceal all wire and cable from being visually exposed where ceilings, moldings or cable trays do not exist.

4.4.3. Conduit from each communication outlet shall extend back to the hallway and terminate just above and within 12" of the cable tray in the hallway. In areas with removable ceiling tiles an alternative would be to stub the conduit to a point just above the ceiling grid. However, if this method is used 2" sleeves must be installed in each interior wall leading back to the cable tray to allow for wiring access. Ceiling support wires are not an acceptable point of support of the horizontal distribution wiring.

4.4.4. Any sleeves or conduits used in the horizontal cabling system must have plastic bushings installed on each end.

4.5. Station Wiring and Termination

4.5.1. All voice, video, and data station wiring will be plenum rated Category 6 UTP. Voice station cable will have a white sheath, video station cable will have a gray /black sheath, and data station cable will have a blue sheath.

4.5.2. Unless otherwise specified all wires in all cables are to be terminated on associated jacks, patch panels, 110 blocks or protector blocks. Voice cables will be terminated on the top jack (red icon); data cables will be terminated on the bottom jack (blue icon).

4.5.3. Each outlet will be wired to support one voice and one data connection, except in locations where only wall telephones are required. All voice and data jacks shall be rated Category 6 and conform to the T568B wiring standard. Additional outlets may be required at vending machines and door entrances.

4.6. Workstation (Multimedia) Outlets

4.6.1. Recessed outlet boxes will be used for combined data, voice, and video services. Outlet boxes will be 4" x 4" x 2 1/8" deep with double gang plaster ring. Each outlet must have two 3/4" conduits with plastic bushings and no more than two 90-degree bends between the outlet and the cable tray. Pull boxes must be provided if more than two 90-degree bends are required. The use of LB, LL and LR fittings will not be approved.

4.7. Emergency & Pay Telephones

4.7.1. Outlets for emergency telephones will be recessed into the wall with specifications provided by PSU. Pay telephone locations will be verified with PSU. All outlets in public areas will conform to ADA height requirements.

4.7.2 Elevator emergency and building hallway emergency telephones will be panel mounted. PSU will determine manufacturer and provide model number for the emergency telephones. This model will meet all current applicable ADA requirements. A 3/4" conduit will be installed from the elevator equipment room to the nearest telecommunications closet. Contractor will provide wiring to elevator box connect point. Elevator Company will make final connection to Elevator. PSU Telecommunications will provide a ring down type circuit for emergency telephones to the PSU Police Department. Installation will not be deemed complete until each phone is tested in the presence of the installation contractor.

4.8. Installation

4.8.1. All work shall be provided by a licensed contractor with a minimum of five (5) years' experience in telecommunications wiring and three (3) projects of comparable size as the job bid. All final connections (punch downs) shall be made by a telecommunications technician with a minimum of three (3) years' experience in this field. Provide copies of all certifications.

4.9. Scheduling

4.9.1. The general contractor will complete the construction of the telecommunications rooms, risers and station outlets in order to allow the installation of communications wiring before the completion of suspended ceilings in areas where above ceiling pull boxes and cable trays are installed.

4.10. Inspection

4.10.1. The designated OIS personnel shall be responsible for the monitoring and quality control of the communications contractor. This will include monitoring workmanship, materials, installation practices and the adherence to all design specifications. Both announced and unannounced inspections during the construction process shall be made.

4.11. Cable Identification

4.11.1. All cable and termination labeling shall be in accordance with the most current EIA/TIA 606 Standards. All labels shall be permanent, non-erasable, stick-on labeling printed using a professional labeling machine.

4.11.2. All Voice/Data outlets will be labeled North, East, South, West, and in a sequential numbering order clockwise 1-2-3-4 around the room. Voice outlets will begin with the letter "V" and data outlets will begin with the letter "D" followed by the room #.

4.11.3. Example: (Data in room 126), (1st outlet on East wall.) = *D-126-E1* these jack numbers will also be labeled on the corresponding patch panel or 110 blocks in the telecommunications closet.

4.12. Repair all defective contractor installed fiber optic feeder splices, copper cables, assemblies, and other contractor provided material. Any fibers that are defective and not related to this contractor's installation will be reported to the ITS Department and handled as a separate issue.

4.13. Mark and stencil all cables, protectors, terminals, and closures. Place cable tags on the new cable plant, which designate the cable number and count.

4.14. Provide two copies of scaled drawings for the installed cable plant meeting all specifications outlined in the Technical Specification Document. Provide the same information on a CD in AutoCAD format. AUTOCAD documentation must be compatible with the latest version in use by PSU. For clarification, this means we will receive the drawings of the cable plant on white paper, and CD.

4.15. Remove, on a daily basis, all debris in associated work areas left as a result of Telecommunications installation.

4.16. All installations must meet or exceed existing industry standards for copper, broadband and fiber optic feeder cable requirements and technical specifications.

4.17. Provide all necessary splicing materials. Provide all necessary bonding and grounding materials.

4.18. The Telecommunications Contractor awarded this project shall coordinate all installation dates and times with the ITS Department. It is imperative that the contractor's work will be completed in time for user occupancy. In the event that installation dates or times need to be modified, the Telecommunications Contractor will be notified by the ITS Department Project Manager at least 24 hours in advance.

5. Specific Requirements

5.1. Installation Requirements

5.2. Where the installation or removal of specific materials requires access by the Telecommunications Contractor to currently operational work spaces or areas, the contractor may be required to perform some or all parts of this project before or after normal University business hours. The University's normal hours of operation may vary according to location and occupancy; however, general business hours are 8:00 a.m. to 4:30 p.m. Monday through Friday. This fact should be accounted for by the Telecommunications Contractor prior to bid submittal.

5.3. Where installations include manufactured products, the Telecommunications Contractor shall comply with manufacturer's applicable instructions and recommendations for installation, to whatever extent these are more explicit or more stringent than requirements indicated in this document.

5.4. The Telecommunications Contractor shall inspect each item of material or equipment immediately prior to installation, and reject damaged and defective items. These materials must conform to University specifications.

5.5. The Telecommunications Contractor shall provide connection devices and methods for securing work properly as it is installed; true to line and level, and within recognized industry tolerances if not otherwise indicated. Allowance for expansion, contraction, and building movements must also be made. The Telecommunications Contractor must provide uniform joint attachment width and spacing in exposed areas of work for the best possible visual and operational effect. Refer questionable visual effect choices to the ITS Department for final decision.

5.6. The Telecommunications Contractor shall use their best judgment when working during conditions of adverse environmental conditions of temperature, humidity, exposure, forecasted weather, and status of project completion which will ensure the best possible results for each unit of work.

5.7. The Telecommunications Contractor shall coordinate enclosure (closing-up) of work with required inspections and tests to avoid necessity of uncovering or reopening work for inspection purposes. The Telecommunications Contractor shall arrange for inspection of the work by University inspectors and shall give the inspectors all necessary assistance.

5.8. Except as otherwise indicated for required approval, labels, and operating data, the Telecommunications Contractor shall not permanently attach or imprint markings on exposed surfaces of products which will be exposed to view either in occupied spaces or on exterior work.

5.9. Locate required labels and stamps on a concealed surface, or, where absolutely required for observation on an accessible surface which, in occupied spaces, is not conspicuous.

5.10. The Telecommunications Contractor must accurately and meticulously provide circuit and wiring identifications at each wiring frame whether the MDF, the building IDF, or other frames as designated by the ITS Department.

5.11. The Telecommunications Contractor shall furnish and install all necessary cable, wire, jacks, terminals, and miscellaneous hardware as required, including outside construction work and underground conduit as required.

5.12. The system shall include electrical surge protection devices and protector assemblies to protect user personnel and prevent system damage or total loss resulting from voltage and current surges.

5.13. The Telecommunications Contractor shall comply in every way with the laws, ordinances, and rules of the State of Kansas, The National Board of Fire Underwriters, the National Electrical Code, National Electric Safety Code, and all local rules and regulations. All components of each system as a whole shall meet or exceed the minimal current standards issued by the EIA/TIA.

5.14. The Telecommunications department uses, and requires contractors to use; Siemon RJ-45 Couplers and Siemon face plates. These face plates connect directly to the plaster ring of the telephone conduit boxes, single and double-gang electrical junction wall boxes (metal or plastic), and Siemon series surface housings. Because the face plates connect directly to these devices, there is no allowance for adjustment for correcting to true alignment and level. Therefore, it is mandatory that the contractor installs the conduit boxes, junction wall boxes, and Siemon series surface housings to true alignment and level.

5.15. The Telecommunications Contractor shall obtain and pay for all licenses, permits, and inspections required by laws, ordinances, and rules governing the work specified.

5.16. The contractor is responsible for making sure his workers and subcontractors follow University Parking regulations. The vendor and his subcontractors are responsible for acquiring the necessary parking permits while performing work on campus. Each individual is responsible for any parking violation citations received while on campus property.

5.17. Disposal of abandoned cable is the responsibility of the vendor.

5.18. Engineering: Vendors shall be responsible for any required engineering to complete the various projects as specified. All requirements in the proposal are intended to comply with current industry standards and codes. All permits, fees, drawings, and associated charges shall be the responsibility of the vendor.

6. Campus Feeder Distribution

6.1. Feeder Cable (Twisted - Pair)

6.1.1. All twisted pair cable used in underground conduit shall be reinforced for protection against environmental damage. Cable in underground conduit shall be waterproof ASP (aluminum steel polyethylene) or PIC type cable. This cable core contains plastic insulated conductors and is filled with waterproofing compound. The sheath shall consist of layers of corrugated aluminum and steel covered by a polyethylene jacket (rodent protection). Additional moisture proofing shall surround the core wrap, aluminum shield, and steel tape layer. Cable used in utility tunnels must have the same specifications with the exception of the waterproofing compounds.

6.1.2. Refer to Appendix A of this document for technical specifications

6.2. Installation of Copper Feeder Cable

6.2.1. All feeder cable will have one end terminated at the building entrance facility on 110 type connecting blocks. These blocks will be either wall or rack mounted. Contractor will obtain the approval of the ITS Department prior to installing the connecting block(s). Inter-building cable will be protected on both ends, and there shall be no bridge tap (multiple) on any feeder cable. Filled cable must not extend into any building or tunnel more than 50 feet unless the cable is enclosed in metal conduit.

6.2.2. Appropriate bonding of the metallic cable sheath is required throughout the physical cable plant with the shield grounded at the building entrance terminal.

6.2.3. Installation Practices

Minimum bending radii	(NEC Article 300-34)
Non-shielded	Not less than 8X O.D.
Shielded	Not less than 12X O.D.

Copper: Tm = .008 x N x CM

N = number of conductors

CM = circular mil area of each conductor

Maximum permissible pulling length (Lm), ft.

Lm = Tm/CW

Tm = Maximum pulling tension, lbs.

W = Weight of cable per ft., lbs.

C = coefficient of friction (usually 0.5 - 0.9)

7. Campus Fiber Optic Feeder Cable Distribution

7.1. The ITS Department desires to use indoor/outdoor fiber cable of a tight buffered construction for the outside cable plant. This eliminates the transition (and splicing) from a gel filled outdoor cable to an indoor rated cable. It also speeds up splicing connectors on the ends of the cable, since the step of removing the gel is not necessary. PSU reserves the right to supply the contractor with the fiber cable for any project.

7.2. Refer to Appendix A for technical specifications

7.3. Installation Feeder Cable (Fiber Optic)

7.3.1. All splices must be fusion type. At each splice point a protective splice enclosure shall be installed for protection and future access requirements. At the building terminal end of each link the fiber shall be terminated, unless otherwise noted, light interface units shall be installed in the room or closet in a standing rack at the MDF's.

7.3.2. The fiber feeder cable will be terminated on individual fiber connectors. Fiber Optic Connectors must be ceramic tip ST connectors with bayonet type twist lock mounting arrangement and terminate in a Light Interconnection unit in a standing rack. Maximum loss per ST connector shall not be more than the stated PSU specifications.

7.3.3. Do not exceed the cable manufactures rated maximum tensile rating during installation.

8. Trenching

8.1.1. The Telecommunications Contractor shall observe all State, Local, and University policies and regulations for trenching and backfilling on University property. The minimum trench depth shall be 36 inches. All trenching will be proceeded with a utility locate by Kansas One Call.

8.1.2. The Telecommunications Contractor must protect existing facilities, utilities (overhead and underground), sidewalks, and pavement. Contractor must repair, at their cost, any damage done by them or any of their subcontractors.

8.1.3. The Telecommunications Contractor must protect graded areas against erosion. Contractor must re-establish grade where settlement or washing occur at no additional cost.

8.1.4. The Telecommunications Contractor must not fill under footings. If excavation is deeper than necessary, fill with concrete of same strength as footing concrete.

8.1.5. Backfilling must be done at a compaction listed.

8.1.6. Under future and existing roadways, parking areas, walk paving, compact to 95% maximum dry density.

8.1.7. For other embankments and fills not listed, compact to 90% of maximum dry density.

8.1.8. Place layers horizontally and compact each layer to specified density prior to placing additional fill.

8.1.9. The vendor can use on-site soils including fat clay and weathered shale as fill. All fill must be reasonably free of roots, organic material, trash, frozen matter, and stones larger than 3". Surplus or unsuitable material must be hauled off-site. There will be no dumping on University property.

8.1.10. If the Telecommunications Contractor finds any material that is unsuitable or cannot be compacted as specified, they must replace it with suitable material at no additional cost.

8.1.11. When a joint-trench method is used, a vertical separation of 6-inches of concrete between telecommunications and other facilities, (i.e., power, gas, etc.), must be maintained.

8.2. The Contractor and all of his sub-contractors must coordinate the cable and conduit access facilities for Telecommunication services with the ITS Department prior to the installation and acceptance of any completed project.

8.3. PVC Conduits - All plastic PVC conduits shall be Schedule 40 unless other circumstances prevail.

8.4. All joints in conduits shall be made so the ends of the pipes come together in the center of the coupling. A maximum of two (2) 90-degree bends total may be included between intermediate pulling points.

8.5. The pull wire to be installed in any conduit must have a minimum of 200 lbs. pulling tension. This should ensure consistency of duct management policy and facilitate future cable additions.

9. Grounding, Bonding, and Electrical Protection

9.1. One of the primary considerations when installing communications distribution systems is protecting property, personnel, and equipment from the potentially harmful effects of foreign electrical voltages and currents. These considerations must include lightning, ground potential rises, and contact with or induction from power circuits.

9.2. Articles of the National Electrical Code (NEC) cover general requirements for grounding, bonding, and protecting electrical and communications circuits. The NEC requirements, however, are primarily based on exposure to power. They deal only incidentally with lightning.

9.3. All building terminals and MDFs shall be grounded in accordance with the latest revision of the National Electrical Code and EIA/TIA Article 607. All Feeder cables must have the sheath grounded at the building entrance terminal. All outside cable plant equipment, including sheath shields, MDF frames, IDF frames, and metal terminal boxes must be individually grounded to a single point earth ground. A copper bus bar (ground window) must be mounted at the bottom left corner of each MDF and IDF. All equipment including the cable sheaths shall be connected to the ground bar with #6 copper ground wire.

9.4. Bonding is the connecting together of all building and equipment electrical grounds to eliminate differences in electrical ground potentials. All cable sheaths shall be bonded in accordance with the National Electrical Code. Appropriate bonding of all feeder and riser metallic cable sheaths is required throughout the cable plant. At each MDF the bus bar shall be bonded to the building earth ground bus using #4 copper cable. Each service block shall be bonded to the distribution frame serving it with a #10 copper wire. This ground must be as close to zero resistance as possible, never exceeding 0.5 ohms, and all cable sheath shields must be connected to the same ground.

9.5. Electrical exposure is when a telecommunications cable or any of its branches are exposed to physical contact or induction of electric current, voltage, or signals. Station protectors are needed even though the communications cable may be unexposed. Examples of this are where premise equipment requires AC power for operation and the AC power is exposed to lighting. Buried cable will usually be exposed to lightning, and all stations served by the cable will need protection even though there may be no exposure to power wires. All outside cable plant shall be considered as exposed to electrical interference.

9.6. Station Protectors

9.6.1. All exposed cables entering a building require a listed station protector to limit the magnitude of foreign voltages. The station protector will arc to ground when the voltage exceeds its threshold limit and shore permanently to ground when there is excessive current. Station protectors are designed to minimize the possibility of injury to personnel and damage to equipment and property.

9.6.2. Protectors must be of the standard general-purpose gas tube 5 pin type with sneak current protection. Must be UL listed.

9.7. Locating Station Protectors

9.7.1. Protector shall be located in, on, or immediately adjacent to the structure or building served and as close as practicable to the point at which the exposed conductors enter or attach. NOTE: Do not serve a building from a protector located in a different building.

9.7.2. When protectors are placed inside a building, select a location that is accessible for maintenance and as near as possible to the point where the power service enters the building.

9.7.3. To ensure that the voltage on the ground wire cannot rise sufficiently to create a hazard, make the length of ground wire from the protector to the grounding electrode as short as possible to provide a low-impedance path.

9.7.4. Install protectors in a location, which will minimize the length of ground wires and bonds to the power grounds.

9.7.5. Ground the cable shields as close to the entrance as possible. Where cable enters in conduit that is buried in a concrete floor, the point at which the cable or conduit emerges from the floor is considered its entrance point.

9.7.6. Bond the cable shield to the protector ground terminal or protector grounding electrode, whichever is closer.

9.8. Ground Points

9.8.1. The grounding system consists of a bonded-together assembly of all of the following electrodes which are available at the premises or structure:

- A buried ground ring
- A concrete-encased electrode
- The metal frame of a building where it is effectively grounded
- Building power ground

9.8.2. The NEC requires that the protector ground, power ground and interior metal water piping always be bonded together even though the underground portion does not have at least 10 feet of metal pipe in direct contact with the earth.

9.8.3. CAUTION: Never use a gas pipe as the grounding electrode for a protector.

9.8.4. A station protector must be grounded to the best available ground. Article 607 of the EIA/TIA refers to grounding in a commercial building. The ITS Department expects all grounding to be done in accordance with this article unless prohibited by state or local codes.

9.8.5. The power service ground is considered the first choice for grounding the protector when no other ground is provided specifically for this purpose. In new construction, an accessible means for grounding the protector shall be provided by the electrical contractor. The acceptable grounds to be provided and used are:

9.8.6. Ring ground - A ground ring encircling a building or structure in direct contact with the earth at a depth of not less than 2 1/2 feet. The ground ring must consist of at least 20 feet of bare copper conductor not smaller than No. 2 AWG.

9.8.7. Concrete-encased ground - An electrode encased by at least 2 inches of concrete, located within and near the bottom of a concrete foundation or footing that is in direct contact with the earth. The electrode must consist of at least 20 feet of one or more steel reinforcing bars of not less than 1/2-inch diameter or 20 feet of bare solid copper conductor not smaller than No. 4 AWG.

9.8.8. The first choice for grounding protectors is the nearest available location on the system or the power service conduit or grounding electrode conductor which is connected to the system. The choice is determined by whichever results in the shortest run of grounding conductor and access availability.

9.9. Installation (Bonding)

9.9.1. Any grounding or bonding conductor which is run through a metallic conduit shall be bonded to the conduit at both ends. No splices are allowed in bonding or grounding conductors since they reduce reliability.

9.9.2. When a protector is installed within a terminal box, bond the protector ground terminal with a No. 6 ground wire to the box.

9.9.3. When a new cable and protectors are installed in a building that has existing protector(s), bond the new protector to the old one(s) even if a separate ground wire is run to the new one.

9.9.4. Bond a splice case for all building cables on the entrance side of the splice case with a No. 6 ground wire.

9.10. Fire Stopping

9.10.1. The telecommunications contractor shall fire stop all through-penetrations in walls, floors, and ceilings in accordance with UBC 4304(e) and UBC 4305(a). Through penetrations shall be further defined to include any open joints, gaps, voids or openings of any kind which would allow the unrestricted passage of smoke, heat or flame from one side of a wall, floor or ceiling construction to the other side.

9.10.2. Fire stopping shall be an approved contractor supplied material, such as safing insulation or fire-rated sealant.

9.10.3. Fire stopping shall be securely installed full width or depth of wall, floor, or ceiling construction and shall be capable of maintaining its integrity when subjected to test temperatures prescribed in UBC Standard 43-1 for the specific wall, floor, or ceiling construction. Install fire stopping material rating in accordance with manufacturer's directions to maintain intended fire-rating as indicated, or if not indicated, one-hour minimum.

9.10.4. Penetrations due to the work of any trade or installer shall be fire stopped as specified herein by that trade or installer. The contractor shall be responsible for overall compliance.

10. Drawings and Test Records

10.1. The University has records and drawings on paper of their Telecommunications Premise Distribution Systems. As modifications or changes are made to the system, it is necessary to update the University drawings and records. Therefore, drawings and records must be provided on this project. The successful contractor will be given paper prints and they are required to prepare and provide scaled drawings illustrating the new distribution system(s) and to provide test results via actual records. The vendor must deliver all drawings and test records to the Office of Information Systems.

10.2. It is the Telecommunication Contractors responsibility to ensure that all building, outside plant, station, and all other records and drawings that would relate to this project are updated. This will include additions that are performed by other parties such as the general contractor or his subcontractors. Questions from the telecommunication contractor regarding this issue should be addressed to the ITS Department prior to bid submittal.

10.3. Furnish operating instructions, service and maintenance instructions, one- line diagrams, data sheets for the exact equipment installed, manufacturer’s parts lists and parts numbers or other identification established by the original manufacturer, schematic diagrams of the frames, and other diagrams included as part of the manufacturer’s data sheets. "As built and installed" drawings shall be included in the service manuals and shall show all cable and terminal markings corresponding with the equipment. One preliminary copy of the information shall be delivered to the ITS Department for approval prior to completion of the manuals. If additions or revisions are required, the contractor shall make them and re-submit a preliminary manual. After approval deliver two copies to the ITS Department.

10.4. Telecommunications Contractor will prepare and submit records and drawings "TO SCALE". Telecommunications Contractor must provide 4 (four) copies on white paper with black print, approximate size 24" x 36". Provide a copy in AutoCAD format.

10.5. Copper feeder cable information to be shown is: cable type, size, gauge, year installed, cable no., pair counts, distance(s) any and all splice location(s).

10.6. Fiber feeder cable information to be shown is: type cable, size, cable number, fiber count, distance(s), splice locations and cable length.

10.7. Terminal information to be shown is: terminal identity, quantity and type of protectors, quantity and type termination blocks, cable and pairs entering and/or leaving.

10.8. Riser cable information to be shown is: cable type, size, gauge, year installed, length, splice points, cable number and pair count(s).

10.9. The telecommunications contractor shall test every pair in every cable, on an end-to-end basis after splicing and termination for conformity to the design standards and specifications. The test procedures and results will be documented with certification that the system meets all applicable standards and specifications. The contractor shall state the beginning date and duration of system acceptance checkout. Performance detail sheets will be submitted for final review and system acceptance by the University. Test record forms are to be completed and turned over to the ITS Department.

10.10. The Contractor shall provide two (2) sets of each test record report to the Office of Information Systems. The following electrical tests records must be provided by the contractor on all feeder copper cables:

- Continuity test on all pairs, (test for opens).
- Test for crosses and shorts, on all pairs.
- Test for loss at 1004hz, on all pairs.
- Test for noise metallic and noise to ground, sampling can be used.
- Test for insulation resistance, sampling can be used.

10.11. The maximum allowable defective copper cable pairs will be in accordance with the following table:

Cable size (pair)	Allowed Defects (pair)
- 100 pr	0
- 600 pr	0
- 900 pr	0
- > 900 pr	less than .2%

10.12. All data cables and connecting hardware will be tested using the most current standards.

10.13. For fiber optic cables the test shall be in accordance with the following outline:

All fibers will be tested and test results provided to OIS for acceptance. All fibers must be identified and labeled from the left to right at the top of every LIU. Testing to include end-to-end dB loss, both directions, at 850 and 1300 or 1310 and 1550 nanometers.

See Appendix A for acceptable loss limits.

11. Appendix A

Cable Specifications

Fiber Optic Cable Technical Specifications:
It is the intention of the ITS Department to use hybrid indoor/outdoor plenum rated cable in all future feeder distribution applications.

Fiber type:	Multimode
Cable Core:	Tight buffer construction
Sheath:	Plenum rated
Numeric aperture:	0.275 +/- .015 micrometers
Core diameter:	62. 5. micrometers
Cladding diameter:	125 +/- 2.0 micrometers
Core to cladding concentricity:	</= 3.0 micrometers
Non-circularity cladding:	< 2%
Non-circularity core:	< 1%
Minimum bandwidth:	200MHz/km at 850 nanometers
500MHz/km at 1300 nanometers	
Chromatic Dispersion:	
minimum zero dispersion wavelength -	1332 nanometers
maximum zero dispersion wavelength -	1354 nanometers
maximum zero dispersion slope -	0.097 ps/(nm2 . km)
Maximum attenuation:	3.00 db per kilometer at 850 nanometers
Maximum attenuation:	1.00 db per kilometer at 1300 nanometers
Minimum proof test (un-cabled:	100,000 lbs per sq. in
Temperature range:	-20 to + 65 degrees Celsius
Cable tensile load:	600 lbs.

All individual fibers must meet maximum attenuation loss over entire temperature range.
All individual fibers must meet minimum bandwidth dispersion.

Fiber type:	Single-mode
Cable Core:	Tight buffer construction
Sheath:	Indoor/Outdoor Plenum rated
Core diameter:	8.3 micrometers (nominal)
Cladding diameter:	125 +/- 1.0. micrometers
Coating diameter:	900.micrometers
Mode field diameter:	8.8 micrometers + or - 0.5 microns
Core eccentricity:	Less than or equal to 1.0 micron
Maximum attenuation:	.35 db per kilometer at 1310 nanometers
	.35db per kilometer at 1550 nanometers
Zero dispersion wavelength:	1310 + or - 010 nm
Max. dispersion:	3.2 ps/nm -- km
Cut-off wavelength:	Max. 1250 nm -- specified by customer
Cable tensile load:	600 lbs
Cable min. bend radius:	15X cable diameter under no load.(0-180lbs)
20X cable diameter under load. (181-600lbs)	
Minimum proof test:	100,000 lbs per sq. in (uncabled):
Temperature range:	-20 to +65degrees Celsius

Feeder Distribution Copper Cable:

Gauge:	24 AWG
Pair Size:	25 to 1500
DC Resistance:	27.3 ohms/1000 ft.
Mutual Capacitance:	15.7 nf/1000 ft. (above 1.0 MHz)
Impedance:	100 ohms (above 1.0 MHz)
Attenuation:	5.49 at 772 kHz and 6.25 at 1.0 MHz
Sheath:	Polyethylene
Shield:	8 mil aluminum or equivalent
Color Code:	Standard PIC 25/50 pr binders

Miscellaneous Equipment (THESE ARE EXAMPLES OF WHAT PSU TYPICALLY USES)

Equipment Rack: Ortronics Mighty Mo - Vendor # MM6710
Data Patch Panel:
24 port - Vendor # PHD66U24
48 port - Vendor # PHD66U48
Voice Cable Termination Hardware:
Mounting Bracket 110RD2-200-19
110 Block Vendor # S110DW2-100

Wall Plate: Siemon CT4-FP-** (duplex) CT8-FP-** (quad) ** denotes color
Wall Jack: Siemon CT-C6** ** denotes color
Blanks Inserts: Vendor #CT-BLNK-** **denotes color

CAT6 Cable (Plenum Rated):
Berk-Tek CMP-00423BKTE-6U-01(White Jacket)
Berk-Tek CMP-00423BKTE-6U-06 (Blue Jacket)

Data Patch Panels: (Either brand is acceptable)

Siemon Cat6 24 port patch panel Vendor # HD6-24
Siemon Cat6 48 port patch panel Vendor # HD6-48

Ortronics Cat6 24 port patch panel Vendor # PHD66U24
Ortronics Cat6 48 port patch panel Vendor # PHD66U48

CIRCA ENTERPRISES 25 pair Protector Block Vendor #1880ENA1/NSC-25
CIRCA ENTERPRISES 50 pair Protector Block Vendor #1880ENA1/NSC-50
CIRCA ENTERPRISES 100 pair Protector Block Vendor #1880ENA1/NSC-100
CIRCA ENTERPRISES 200 pair Protector Block Vendor #1880ENA1/NSC-200

Rack Mount Fiber enclosure: Vendor # 615MMC-36-00 (This is only an example of what we want. These need to be sized correctly for the closet that they will be serving.)

Corning 012E88-33131-29 12-Fiber, Plenum, 8.3/125 SM (This is the fiber that we would like run between communication rooms OR equal quality)